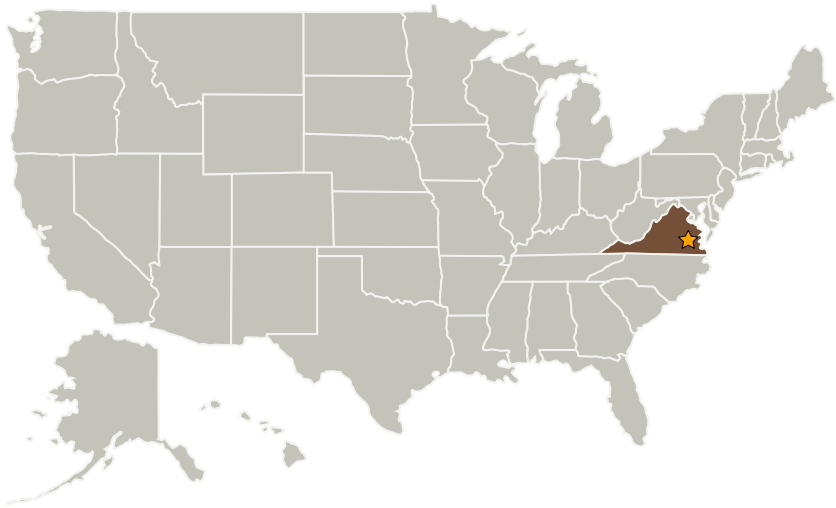
# Validation Tools and Methods for Diagnostic Systems, Phase II

Completed Technology Project (2009 - 2011)

## Project Introduction

The potential benefits of advanced algorithms for diagnostics and prognostics, inner-loop control, and other flight critical systems have been demonstrated in a number of research efforts. Because many of the new algorithms differ significantly from the approaches used in most operational vehicles, and because of factors such as non-deterministic behavior due to adaptation, flight certification of the approaches has been challenging. Verification and validation (V&V) of advanced control laws has received significant research attention, and progress has been made in terms of tools, methods, and architectures for facilitating V&V. Building on this prior V&V work, the proposed research will develop innovative methods and tools for validation of diagnostic systems. The Phase I research demonstrated the value of probabilistic analysis in general, and generalized Polynomial Chaos techniques specifically for measuring diagnostic system performance. The Phase II research will further develop probabilistic methods, and will combine them with worst-case analysis techniques to assess traditional diagnostic system metrics, as well as interactions between diagnostic systems and inner-loop control approaches. Building on the CAESAR tool control law validation tool, a software package to facilitate validation of diagnostic systems will be implemented, and the tool will be demonstrated on a representative diagnostic system.

## Primary U.S. Work Locations and Key Partners

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## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Langley Research Center (LaRC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

**Small Business Innovation Research/Small Business Tech Transfer**

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| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| ★Langley Research Center(LaRC) | Lead Organization | NASA Center | Hampton, Virginia |
| Barron Associates, Inc. | Supporting Organization | Industry | Charlottesville, Virginia |

| Primary U.S. Work Locations |
|---|
| Virginia |

### Project Transitions

**January 2009:** Project Start

**September 2011:** Closed out

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

## Technology Areas

**Primary:**

- TX15 Flight Vehicle Systems
  - TX15.2 Flight Mechanics
    - TX15.2.2 Flight Performance and Analysis